

WHAT IS CLAIMED IS:

1 1. A method of testing a firewall comprising:  
2 transmitting at least one of a session initiation  
3 signal to initiate a communications session through said  
4 firewall and a session termination signal used to  
5 termination an established communications session; and  
6 monitoring to determine from the time of at least one  
7 transmitted signal at least one of a port opening delay  
8 which occurs in regard to opening a port in said firewall  
9 for a communications session that is being initiated and a  
10 port closing delay which occurs in regard to closing a port  
11 in said firewall when terminating an established  
12 communications session.

1 2. The method of claim 1, further comprising:  
2 transmitting session signals at an increasing rate  
3 through said firewall to cause at least one of the opening  
4 and closing of ports in said firewall; and  
5 measuring the effect of said increasing rate of  
6 session signals on at least one of an opening and a closing  
7 delay time associated with opening a port and closing a  
8 port, respectively, in response to transmitted session  
9 signals.

1 3. The method according to claim 1, wherein said at least  
2 one of a port opening delay and a port closing delay is a  
3 port closing delay.

1 4. The method of claim 3, further comprising:  
2 transmitting session signals at an increasing rate

3 through said firewall to cause at least one of the opening  
4 and closing of ports in said firewall; and  
5 measuring the effect of said increasing rate of  
6 session signals on at least one of an opening and a closing  
7 delay time associated with opening a port and closing a  
8 port, respectively, in response to said session signals.

1 5. The method of claim 4, further comprising:  
2 determining an average closing delay for each of a  
3 plurality of different session signaling rates.

1 6. The method of claim 5, further comprising:  
2 generating a visual display of a graph illustrating  
3 the average closing delay for a plurality of different  
4 session signaling rates.

1 7. A method of testing a network firewall comprising:  
2 transmitting a session signal to terminate an ongoing  
3 communications session being conducted through at least one  
4 port of said firewall; and  
5 measuring a port closing delay time associated with  
6 the closing of said at least one port following the  
7 transmission of said signal to terminate said  
8 communications session.

1 8. The method of claim 7, wherein said port closing delay  
2 is a time period which occurs between the time a signal  
3 used to cause the closing of the port is detected and said  
4 port ceases to allow communications signals to pass through  
5 from the first side of said firewall to the second side of  
6 said firewall.

1 9. The method according to claim 8, further comprising  
2 the steps of:

3 transmitting test signals at said port prior to the  
4 closing of said port; and  
5 monitoring the port to determine when said test  
6 signals cease passing through said port.

1 10. The method of claim 7, further comprising:

2 repeating said initiating transmitting and measuring  
3 steps while increasing a rate of session signals sent to  
4 said firewall to load said firewall; and  
5 monitoring changes in port closing delay times in  
6 response to said increasing rate of session signals to  
7 determine effect of increasing levels of session signaling  
8 on closing delay times.

1 11. The method of claim 10, further comprising:

2 determining the level of session signaling that causes  
3 a closing delay time which exceeds a preselected maximum  
4 closing delay time.

1 12. The method of claim 10, further comprising:

2 determining the amount of firewall processing power  
3 required for a particular application based on an expected  
4 traffic load and said monitored information indicating the  
5 effect of session signaling of different loads on said  
6 closing delay.

1 13. The method of claim 7, wherein said session signal is  
2 at least one of SIP and H.323 compliant signals.

1 14. A method of testing a network firewall, comprising:

2 transmitting a session signal to initiate a  
3 communications session to be conducted through said  
4 firewall;

5 transmitting test signals to at least one port on a  
6 first side of said firewall;

7 determining a time when said test signals first pass  
8 through said at least one port, said at least one port  
9 being opened in response to said signal to initiate a  
10 communications session; and

11 determining a port opening delay which occurs in  
12 regard to opening a port in said firewall for said  
13 communications session from said determined time.

1 15. The method of claim 14, wherein said port opening  
2 delay is a time period which occurs between a time a signal  
3 used to cause the port for said communications session to  
4 open is detected and said port allows a signal to pass  
5 through from the first side of said firewall to the second  
6 side of said firewall.

1 16. The method according to claim 15, further comprising  
2 the step of:

3 transmitting another session signal to terminate said  
4 communications session; and

5 monitoring a port closing delay time corresponding to  
6 a port closing delay which occurs in regard to closing the  
7 port in said firewall that was opened for said  
8 communications session.

1 17. The method of claim 16, wherein said port closing  
2 delay is a time period which occurs between the time a

3 signal used to cause the closing of the port is detected  
4 and said port ceases to allow communications signals to  
5 pass through from the first side of said firewall to the  
6 second side of said firewall.

1 18. The method of claim 14, further comprising the steps  
2 of:

3 transmitting session signals at an increasing rate  
4 through said firewall to cause at least one of the opening  
5 and closing of ports in said firewall; and

6 measuring the effect of said increasing rate of  
7 session signals on at least one of an opening and closing  
8 delay time associated with opening and closing ports,  
9 respectively, in response to said session signals.

1 19. The method of claim 18, wherein said session signals  
2 are at least one of SIP and H.323 compliant signals.

1 20. A firewall test apparatus, comprising:

2 a session signaling module for generating session  
3 signals used to initiate a communications session to be  
4 conducted through a firewall to be tested and to terminate  
5 a communications session after it has been initiated;

6 a scanning probe generation module for generating  
7 probe signals to be directed at firewall ports;

8 a timing synchronization module for synchronizing  
9 operation of said firewall test apparatus to at least one  
10 of an external clock source and another firewall test  
11 apparatus; and

12 an analysis module for determining at least a port  
13 closing delay from a session signal time and a time probe  
14 signals are detected to stop passing through a port in said

15 firewall corresponding to an initiated communications  
16 session.

1 21. The firewall test apparatus of claim 20, wherein said  
2 analysis module further includes means for determining at  
3 least a port opening delay from a session signal time  
4 associated with a session signal used to initiate a  
5 communications session and a time probe signals are  
6 detected to start passing through a port in said firewall  
7 corresponding to the initiated communications session.

1 22. The firewall test apparatus of claim 21, wherein said  
2 session signaling module includes means for flooding said  
3 firewall with increasing amounts of session signal traffic  
4 used to initiate and terminate communications sessions.

1 23. The firewall test apparatus of claim 22, wherein said  
2 analysis module includes:  
3 means for determining the effect of increasing amount  
4 of session signaling flooding said firewall on the closing  
5 delays associated with terminating existing communications  
6 sessions.

1 24. The firewall test apparatus of claim 23, further  
2 comprising:  
3 an output device for outputting a report showing the  
4 effect of flooding said firewall with increasing amounts of  
5 session signals on the closing delays associated with  
6 terminating existing communications sessions.

1 25. A firewall test system for testing a firewall,

2 comprising;

3 a test signal generator for generating communications  
4 session initiation signals and probe signals directed at a  
5 first side of said firewall; and

6 a test signal analyzer for detecting probe signals  
7 passing through said first side of said firewall to said  
8 second side of said firewall and for determining port  
9 closing delays as measured from the time the test signal  
10 analyzer detects a signal used to close a port in said  
11 firewall and said analyzer ceases to detect test signals  
12 passing through said firewall.

1 26. The firewall test system of claim 25, wherein said  
2 test signal generator further includes:

3 means for establishing a communications session  
4 through said firewall using session initiation signals  
5 prior to transmitting at least some of said probe signals.

1 27. The firewall test system of claim 26,  
2 wherein said test signal generator includes means for  
3 synchronizing test signal generation to an outside clock  
4 source; and

5 wherein said signal analyzer includes means for  
6 synchronizing device operation with said outside clock  
7 source.

1 28. The firewall test system of claim 27, wherein said  
2 test signal generator includes means for flooding said  
3 firewall with session signals which trigger the opening or  
4 the closing of ports in said firewall.

1 29. The firewall test system of claim 28, wherein said

2 test analyzer further includes:

3 means for measuring the effect of increasing the rate  
4 of session signals on port closing times following the  
5 termination of a communications session.

1 30. A method of testing a firewall, comprising the steps  
2 of:

3 transmitting session signals used to control at least  
4 one of the establishment and termination of communications  
5 sessions through said firewall at an increasing rate; and  
6 measuring the effect of the increasing rate of session  
7 signals on port closing delays associated with the  
8 termination of communications sessions through said  
9 firewall.

1 31. The method of claim 30, further comprising;  
2 determining the session signal rate which results in a  
3 maximum acceptable port closing delay being exceeded.

1 32. The method of claim 31, wherein said transmitted  
2 session signals are at least one of SIP signals and H.323  
3 signals.